The Model Engineer

A Journal of Small Power Engineering.

Edited by Percival Marshall. C.1.Mech.E.

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Our Point of View.

Speed Boats of 1922.

The following officially recorded speeds of boats entered in the *M.E.* Speed Boat Competition, 1922, show that rumour does not always lie. The performances put up not only compare favourably with those of the previous year, but the long looked for 30 m.p.h. has been handsomely exceeded. It is not easy to conceive what Mr. Noble attained, when, with his Bulrush III he clocked 32.56 miles per hour. It is still less conceivable what effort, endurance, and determination must have been brought into play during the building, fitting, tuning and running of his tiny monster, and in offering him our congratulations upon establishing a speed record which will live, in all probability, a very long time, we should also like to express our own appreciation, and that of all those who know what power boat racing means, of the part played by the other competitors who have helped to make the sport the science it is to-day. It is pleasant, too, to see after an interval of so many years the reappearance of some of " the old hands at the game." For instance Mr. Groves, whose series of Irenes did so much in making and breaking records in past years, is again figuring in Class D. A little while ago it will be remembered Mr. Noh!e appealed through the columns of the M.E. for a goodly number of entries, ever, though everybody could not hope to break records, and it was in response to that appeal, Mr. Groves tells us, that he conceived the idea of doing what he could in the desired direction. The trouble was he had no hull, and we believe we are correct in saying, only a long disused engine from one of the Irenes. However, the excuse was there, and Berti, as we saw her at the last Exhibition, materialised within a month ! Many of the figures here recorded as official have, however, been exceeded during unofficial runs. The performance put up by *Mystery* is not near what would have been recorded had the Fates been kinder. The story of Mr Westmoreland's experiences with her towards the end of iast year is quite a tragic one, and when it is told, as we hope it will be in these pages before long, will provide a record the like of which happily does not often occur.

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The ME. Speed Boat Competition,

Of the four Classes open to competitors in the M.E. Speed Boat Competition, 1922, no entries were received for the heaviest, but in Classes B, C, and D, the following boats have been awarded medals and certificates.

CLASS B.-Displacement over 20 lbs., but not exceeding 30 lbs.

Mr. Butler's Luna, steam hydroplane. Speed 14.8 m.p.h Silver medal.

CLASS C.-Displacement over 10 lbs., but not exceeding 20 lbs.

Mr. G. D. Noble's Bulrush III, steam hydroplane. Speed 32.56 m.p.h. Silver medal.

Mr. A. Norman Thompson's Sunny Jim III steam hydroplane. Speed 20.33 m.p.h. Bronze medal.

Mr. Robert Kerr's Kelpie, steamer-launch type. Speed 14.6 m.p.h. Certificate.

Mr. J. A. Walter's Zu=Zu, steamboat. Speed 10.67 m.p.h. Certificate.

CLASS D-Displacement under 10 lbs.

Mr. J. H. Dade's *Peg,* steam hydroplane. Speed 22.55 m.p.h Silver medal.

Mr. F. Westmoreland's *Mystery,* steam hydroplane. Speed 22.05 m.p.h. Bronze medal.

Mr. H. H. Groves' Berti, steam hydroplane. Speed 21.6 m.p.h. Certificate.

* * +

Technical Research.

In company mith a gathering of Press representatives we had the pleasure, a few days ago, of visiting the Research Laboratories of The General Electric Co., Ltd., at Wembley, in the

neighbourhood of London. The visit was exceedingly interesting. not only from the point of view of equipment installed and work carried on, but by reason of the object lesson these laboratories give as recognition of the importance and value of experiment and research to industrial undertakings. In particular to a concern with a business of the character of that carried on by The General Electrical Co., that is, manufacture of the entire range of electrical supplies, including batteries, lamps, dynamos, motors, telephones and so on, facilities for research work must be of great value. The laboratories are extensive and have arrangements specially planned for the purpose to which the establishment is devoted. We hope later on to publish photographs and a description. A special feature is the installation within the building of lamp and wire manufacture as factory processes on a small scale. The difficulties experienced by the actual factory organisation can thus be studied in conjunction with endeavours to effect improvements and investigate defects and imperfections. By this plan a check may be effected upon the processes without hindrance and interference to the commercial factories, and search for improvement effected simultaneously The laboratories have also been arranged so that scientific research may be carried on in whatsoever direction may be desirable. We mention now one item which shows the thoroughness with which the scheme has been devisecl. A service of main pipes conveying a supply of coal gas, a fine vacuum, a coarse vacuum, a general vacuum, compressed-air and water are installed, so that any of these can be tapped off in any laboratory ; there is also a service of hydrogen gas over part of the building and an electric supply everywhere, the systems for the latter being grouped into permanent and experimental Metal and woodworking workshops are installed, so that appliances of various descriptions can be made. The laboratories have been in course of development since the early part of last year ; an opening ceremony was held on February 27. when a large number of visitors were entertained by the Company and made a tour of inspection An invitation was given to representatives of the Press to visit the laboratories on the previous day, so that they might have an unimpeded view and better facilities for explanations. We express our acknowledgments for this and appreciation of the courtesy and efforts of the management and staff to ensure the comfort of their guests and in giving information and opportunity to view the establishment under specially favourable conditions. The occasion was very enjoyable and instructive, and the arrangements throughout were typical of the excellent way in which The General Electric Company carry through functions of this kind

Model Engineering in New Zealand.

Whilst sending us a little practical item for publication in the M.E. a New Zealand reader, Mr. E. C. Dearman, 25, Fairview Crescent, Kelburn, Wellington, N.Z., mentions that he would be pleased to hear from any Wellingtonians interested in model work with a view to the formation of a society of Model Engineers in that city. if this proposal materialises it will mark the inauguration of the first S.M.E. in that self-governing colony.

* * *

A Model Engineer in Stafford.

A London model maker and a member of the London S.M.E. who has had a good deal of experience with small petrol motors and model power boats and who is generally interested in most other branches of model nork, bar wireless, now finds himself in Stafford, where business promises to keep him for some considerable time. He writes to say he would be glad to get in touch with any M.E. readers in that district and would be willing to lend a hand with any interesting model work that is going forward in order to make his leisure hours-which we believe are not too abundant- less lonesome. Should this catch the eye of any readers who would care to act upon this suggestion we will bc pleased to forward their letters, which should be addressed to G. L. care of us. We may add that G. L. is well-known to us personally.

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The Use of Model Experiments in Engineering.

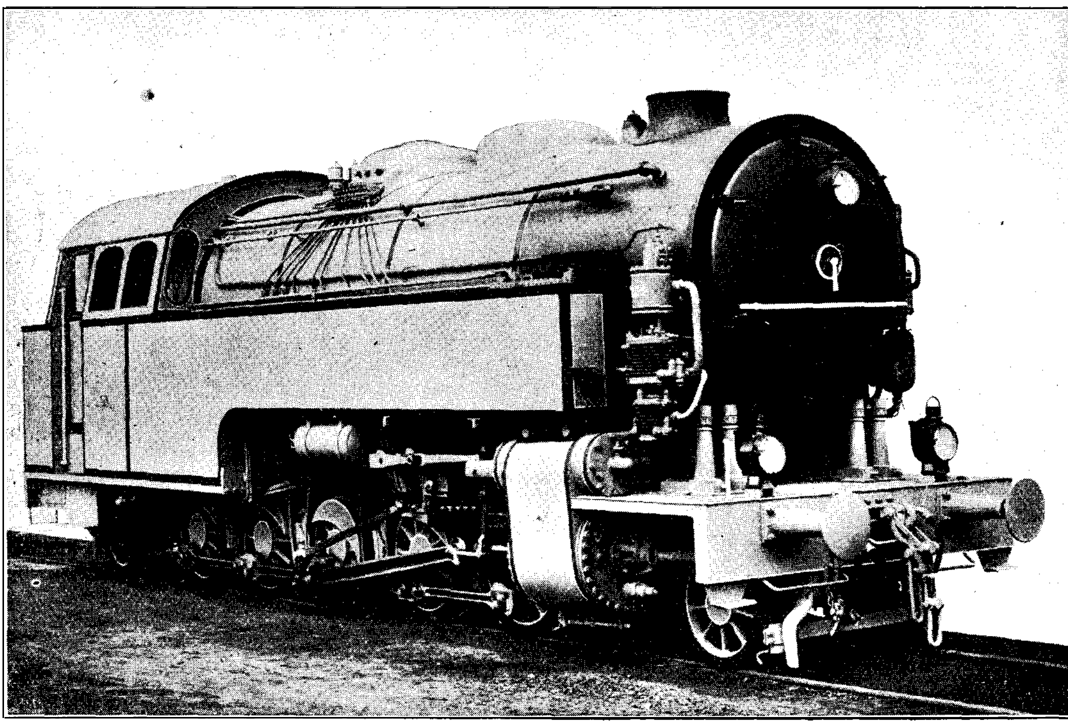
Under this title a lecture has been given on Thursday, February 8, in Manchester, by Professor A. H. Gibson, D Sc., before the graduates' and students' sectidr. of the Institution of Mechanical Engineers (North-Western Branch). We have not, so far, been able to see a report of this lecture but the Honorary Secretary, Mr. E. H. Lewis, M.Sc., has kindly gtven a few particulars in which he states that Professor Gibson deals with the conditions in order that a model may reproduce the behaviour of the full-sized original, and that the lecture was concerned chiefly with ships and aeroplane resistance. Much information of considerable value has been obtained and is obtainable through experiments with models, and we are pleased to note this recognition of the utility of models in engineering. We have no doubt that the lecture was very interesting and feel sure that it will conduce to results of utility From an educational point of view we consider that Professor Gibson is to be congratulated upon his choice of subject for the audience he was to address. Being the annual lecture all classes of members of the Institution had been invited to attend.

Locomotive News and Notes.

By CHAS. S. LAKE, A.M.I.Mech.E., M.1nst.L.E.

Heavy TANK LOCOMOTIVES FOR SERVICE IN GERMANY.

Until comparatively recently traffic on the Halberstadt-Blankenburg Railway was worked by means of rack locomotives, the steepest gradient being about 1 in 40 combined with a curve of 984 ft. radius. These rack locomotives are now being replaced by heavy adhesion tank locomotives of the 2-10-2 type, four of which have already been delivered to the railway company. The engines have been built by the firm of A. Borsig, Berlin, and one of their number is iilustrated herewith. Distinguishing features of the new class are the large proportions employed throughout, particularly in respect of the boiler, which latter has an inside diameter of 6 ft. 6 3/4 in., the barrel containing 255 fire tubes and 32 superheater flues. The distance between the tube plates is 12 ft. 1.1-16 in. A working pressure of 200 lbs. per sq. in. is carried, and the total heating surface amounts to 2,520 sq. ft., including superheater surface, which contributes 580 sq. ft. The grate area is 42.4 sq. ft.



2-10-2 Type Superheated Steam Tank Locomotive for Halberstadt-Blankenburg Railway Co. (Germany).

Special attention has been given to the arrangement of the wheelbase, so that in spite of its ten-coupled wheels the engine is adapted for negotiating curves with due facility. The front and rear truck axles are mounted radially, whilst liberal side play is afforded in the second and rearmost coupled wheels, the driving axle being fitted with flangeless wheels. The frame is of the bar type 3.15-16 in. thick. As the photograph shows the cylinders are placed outside the frames with piston valves mounted above them, Walschaerts gearing being employed for actuating the valves. The cylinders have a diameter of 27.9-16 in. and a piston stroke of 21.11-16 in. A special type of sand distributing mechanism is employed in order to ensure maximum effectual use being made of the adhesion weight. The engine is fitted with the Knorr brake and Riggenbachs counter-pressure air brake, in connection with which the steam cylinders operate as air compressors, and the driving mechanism employed as a braking medium. It 1s stated

that this medium has proved an excellent and reliable means of controlling heavy loads on steep gradients with absolute safety. The sand spraying device also operates by means of compressed air.

The equipment of the locomotive includes two water gauges, a feed water heater with feed pumps and-steam heating apparatus. The driver's cab is of spacious proportions. and can be closed entirely during the passage of the train through tunnels. The water supply is carried in two side tanks with an additional tank below the cab. Experience with these locomotives proves that thev are able to deal with heavier loads on the 1 in 40 gradients and even steeper ones by plain adhesion, the hauling capacity of one of the engines being three times that of the rack locomotives previously used.

The total water capacity is 1,900 gallons and three tons of coal are carried. The engine in full working order weighs 100 tons, of which 75 tons are available for adhesion. The coupled wheels have a diameter on tread of 3 ft. 7.5-16 in.

" ADVANCED " LOCOMOTIVE TYPES.

There is a natural tendency nowadays to restrict where possible the building of new locomotives to those of the more " advanced " types, in order more fully to meet the demand for greater unified power output, and by so doing avoid the running of double-headed trains. In this country loading gauge limitations influence development in greater degree than in many others, but here as well as abroad the discarding of erstwhile " popular " types for more modern ones is a process that gains favour wherever practicable. It is not only loading gauge but weight considerations that control locomotive development, and, as we know, but for this heavier and more powerful engines would today be at work on certain of the main lines, whereas in the prevailing circumstances their use is prohibited. Recent years have witnessed the more general introduction on railways in the United Kingdom of the 4-6-0, 2-8-0 and 2-6-0 types, whilst during the past few months very powerful locomotives having the 4-6-2 whcel arrangcment and three high-pressure cylinders have been placed in service on one of the leading combined trunk line systems. With the grouping of railways added facilities for more widely testing varied classes of engines not hitherto available in so general a sense will arise, and this, as seems likely, may lead to the more general adoption of certain of the more advanced types, which at present have only a restricted use. All this notwithstanding, the all-round efficiency of some of the less advanced designs will remain unchallenged even when the fact that they cannot compete with the latest and largest locomotives where the heaviest classes of traffic are concerned has been admitted.

OVERLOADING THE LOCOMOTIVE.

The consistent overloading of locomotives on railways is obviously bad practice, as, apart from any question of damage to the enqine itself, this practice renders difficult the maintenance of punctual working. It would be difficult to specify instances of such overloading on railways in this country although isolated cases doubtless occur. No amount of foresight can suffice to prevent an occasional excess of load over engine-power, and when this arises it is often weather conditions and not the make-up of the train itself that provides the cause of the difficulty. The very large number of efficient locomotives belonging to what we may term the second-class, owned bv the companies, form the backbone of the locomotive stock, and in the aggregate they perform a vast amount of highly useful service in an economical and satisfactory fashion. The largest and more expensive engines are not available in sufficient numbers to assure freedom on all occasions from overloading of the smaller and less powerful ones; but in spite of this cases in which lost time can be traced to inability on the part of the engine to perform the work required of it, owing to weight of train, are not only fewer than they were, but always becoming less. Serious overloading throws a great strain on the boiler in its effort to maintain the steam supply, and, as a matter of course, other portions of the construction are stressed as well. Nevertheless, in such cases the steam locomotive in its present form is more favourably situated to withstand the strain than, for example, one built on the internal-combustion principle, for with the latter a real excess of overload is a serious matter on thermal grounds alone.

THE Institution of Structural Engineers is now the title of what was originally the Concrete Institute. The Secretary is Captain M. G. Kiddy. F.I.S.A.. Denison House, 296, Vauxhall Bridge Road, London, S.W.I, to whom all communications should be addressed.

C. P. (Harlesden).-Provided the job is quiet and does not induce your neighbours to raise any complaint all will be well. You should notify your fire insurance company of the addition, and get them to inspect the premises when the wiring, etc., is completed. The latter should be carried out to comply with their requirements.

A Model Experimental Steam Car.

By E. B. PARKER.

THE writer recently came across a working model of a motor-car constructed over eighteen years ago by a boy of seventeen. The chief point of interest in this piece of work lies in the ingenuity and patience evinced in its construction.

The only tools used were a pair of tin shears, a file, soldering iron, an archimedian drill and a tap and die. The die was formed from a pole piece of an old compound magnet, in which there was a tapped hole about 3-32nd in. in diameter ; a piece of tool steel wire was threaded in this die, fluted with a file and hardened.

The car is a model of a petrol engined car, and the engine (Figs. I and 2), which is driven by steam, was built to resemble a petrol engine. It is of the single-acting type with twin cylinders of about 5/8 in. bore by I in. stroke, the cranks are 180 deg apart. The cylinders, which are thin brass tubes, are soldered together and let into a tin plate forming the top of the crankcase, whilst the cylinder heads are built up of sheet tin, and unless one has attempted this kind of work it is difficult to appreciate it. Sheet tin was used for the crankcase, engine bearers, inlet and exhaust pipes and lagging.

The pistons are of cast lead and were cast in the cylinders, a wooden rod forming the core. A packing recess was filed round the top of each piston. Eccentric rods, connecting rods, and the crankshaft are of wire, and the last, which is 1/8 in. diameter, runs in bearings of brass tube. The engine is fitted with poppet valves

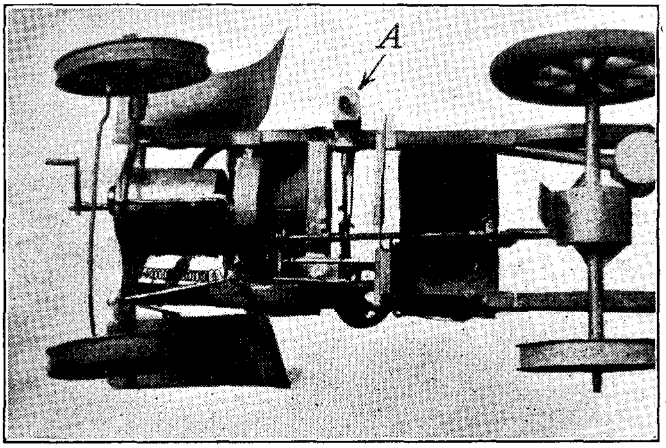


Fig. 3.-Plan View of Car with Engine in Position.

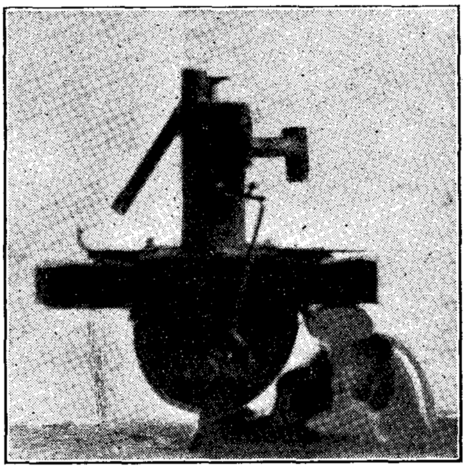
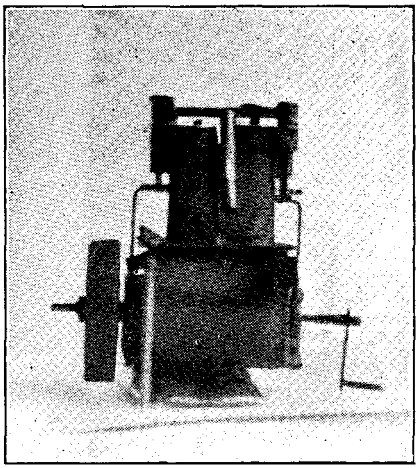


Fig. I.-End View of the Engine.



Flg. Z.--Side View of Engine.

by eccentrics, on the crankshaft, through eccentric rods and rocking levers. There are two eccentrics,, one to each cylinder, and each eccentric actuates an inlet and an exhaust valve. The rocking levers open the valves which are returned to their seatings by springs. There is a short interval between the closing of the inlet valve and the opening of the exhaust valve, which permits some degree of expansive working. Tin washers, 3-16th in. diameter, form the valves, the wire stem passes through the valve and is riveted and soldered in position.

The rocking levers, which are of clock spring, are secured on their shafts by an ingenious device ; a spring, the last coil of which is of reduced diameter, is fitted over the lever spindle and the small coil slipped into a nick filed in the spindle. In a similar manner the valve springs are received.

The engine functioned very well at low and at high speeds, and would turn over so slowly that it seemed impossible for it to pass the dead centres ; steam pressure during trial varied from 3-5 lbs. per sq. in.

In order to 'obtain the photographs, the engine had been removed from the: car and the boiler which supplied steam during the trial was simply a half pound coffee tin standiag over a gas-ring.

The chief dimensions are given below :-

Length over-all, 4 1/2 ins.

Width over engine bearers 3 1/2 ins.; height 4 ins.

Cylinders, 5/8in. bore, 1 in. stroke.

Crankcase, 2 ins. in length and 1 5/8 ins. diameter.

Flywheel (of cast lead), 2 ins. diameter.

Weight about IO ozs.

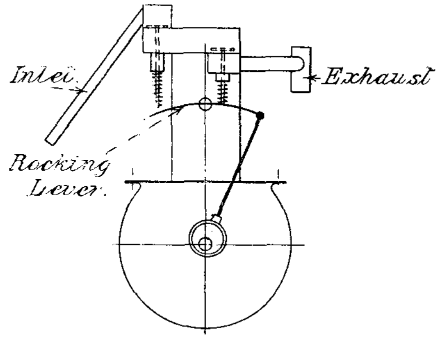
Channel section girders of tin form the chassis, the front and rear axles are fitted with quarter and half elliptic springs respectively, clock spring is the material of which they are made.

The steering gear and the differential are the most interesting parts of the chassis ; the former, on the Ackermann system, is of the worm and worm wheel type ; the worm was formed by winding wire round the steering wheel rod and soldering it in position

Wheels from an alarm clock were used in the construction of the differential, the teeth being carefully bent to form the bevei wheels.

A rectangular boiler is situated under the front seat; it has an internal firebox, which is fitted with three cross-water tubes, and the fumes from the spirit lamp pass through a single fuel tube, of rectangular section, the cutlet of which is on the opposite side of the car to that seen in Fig. 4. This boiler appears to be deficient in steaming qualities, the builder states that the car mould travel about eighteen feet and then stop for want of steam but this may be due to the fact that the engine is geared down considerabiy.

Just below the driver's seat (Fig. 4) the: water gauge may be seen, this gauge is really a glass window in the boiler shell ; the small lever to



Diagrammatic Sketch showing Valve Motion.

the right of the gauge is the throttle Fig. 3 shows the arrangement of the chassis; the feed pump (.A) is actuated by an eccentric on the propeller shaft; the eccentric strap can be disengaged from the sheave bv means of the lever in front of the water gauge. (Fig. 4.)

A clock pinion forms the pump barrel, the plunger is made from a piece of rod which exactly fitted the hole in the pinion. The valve chambers are made of sheet tin and the valves were constructed in a similar manner to those of the engine ; an incredible amount of patience is displayed in the construction of this pump, which functioned perfectly, but owing to the iimited duration of run it was not required; this explains the absence of the water tank.

The starting handle is used to start the engine when it stopped on a dead centre.

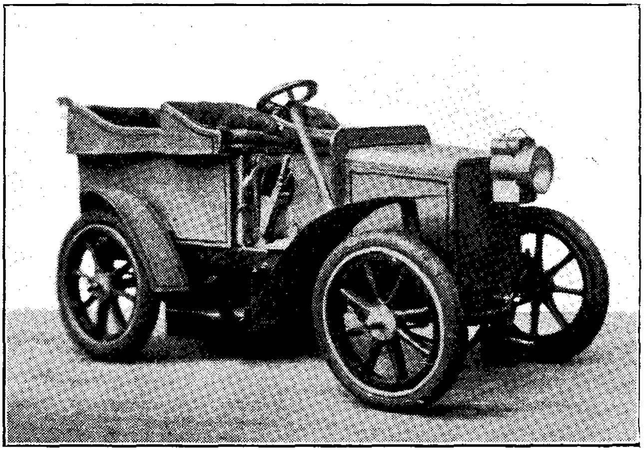


Fig. 4.-The Model Car driven by the Experimental Steam Set.

Automatic Feed for Surfacing in the Lathe.

By B. PEDDER.

DURING a rush of work some time ago it was found necessary to bring into use a non-screwcutting lathe that is generally reserved for milling jobs, pattern-making and wood turning. The headstock is backgeared and is fitted with division plate and index, also the spindle projects at the back a good way, and it has been used to hold large diameter patterns during wood turning, with a floor rest. There is an overhead gear for driving from the workshop line shaft, and is used for milling, gear-cutting attachments, etc. The slide-rest has a long surfacing slide on the bottom slide. The gear here described was made up to render the feed automatic when the cross-slide was in continuous use.

The slide-rest spindle on the cross-slide is screwed 10 t.p.i. square threads; but as the front end did not project far enough to take the gear in mind, a new spindle was made to allow for fitting the toothed wheel, pawl arm and nut and leave room for an ordinary handle for running the slide back for the next cut. A hunt through the oddments box resulted in the salvage of a $3\frac{5}{8}$-in. diameter cast-iron wheel blank $\frac{3}{8}$ in. wide with large solid boss. This casting was finished to the sizes given in 4 on drawing :— Turned down to 3.4 ins. diameter bv 5-16th in. wide, the over-all width of boss was reduced, as shown, and bored to be a tight lit on spindle end, and is fixed by means of a small taper pin, as shown in the detail assembly drawing, Fig. 1.

When finished so far it was rigged up and the teeth cut :—

Number of teeth, 32 10 D.P.
Working depth of tooth, .2000 in.
Whole depth of tooth, .2157 in.
Circular pitch, .3142 in.
Thickness of tooth on pitch line, .1571 in.
Addendum, .1000 in.

32 teeth works out well for various feeds, as will be seen later. While the teeth were being cut the wood pattern for the pawl arm 5 was put in hand.

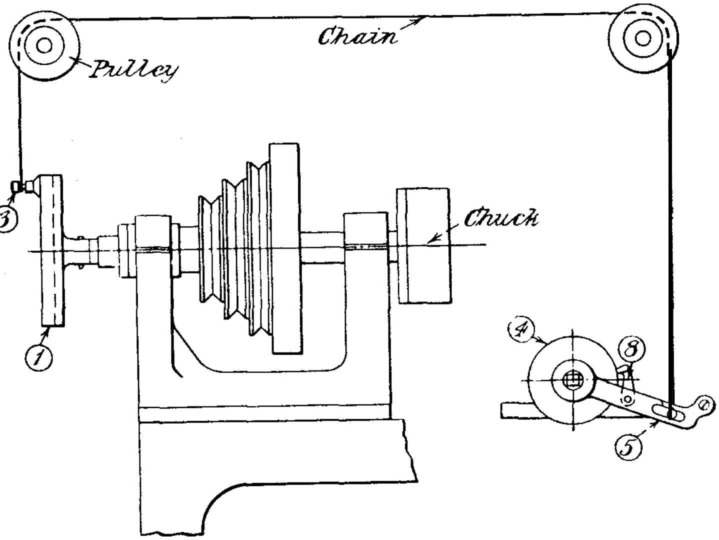
The end of the arm was made to open to allow the pin 9 to be slipped off the arm, so that the chain did not foul when running the slide back at the end of the cut. The slot and latch piece were finished with a file, the boss at the other end of the arm was machined both sides, drilled and bored to be a nice easy fit on the spindle end, so that it will drop back under its own weight. It is prevented from coming off by a standard $\frac{5}{8}$-in. Whitworth lock-nut, the slide spindle being threaded 11 t.p.i. for 9-16th in. from the end just enough to take the nut without binding the pawl arm.

The Pawl (8).

The pawl is of steel filed to size, to fit the teeth on the wheel, a distance piece being used to bring it into position. This completes the attachment as far as the slide-rest is concerned.

The Slotted Plate (1).

This was made out of an old scrap cast-iron blank casting. The boss was bored out and screwed to fit the end of the headstock spindle and the slots milled out as per drawing, Fig. 2.



Arrangement of Drive for Automatic Cross-Slide Feed.

A wood pattern we had was altered to suit and used for the adjustable pin-holder part 2. This allows the pin 3 to be adjusted for position at any point between centre and outer rim of plate or beyond if desired. This effects an adjustable travel or pull on the chain that operates the pawl arm and also varies the number of teeth that the paw-1 moves over.

A useful formulae for finding the amount of travel or feed imparted to the tool is :—

$$l = \frac{n}{d} \times p$$

Where :—

l = The amount of feed given to tool at each stroke of pawl arm

d = Total number of teeth in ratchet wheel.

n = Number of teeth covered by pawl in each stroke.

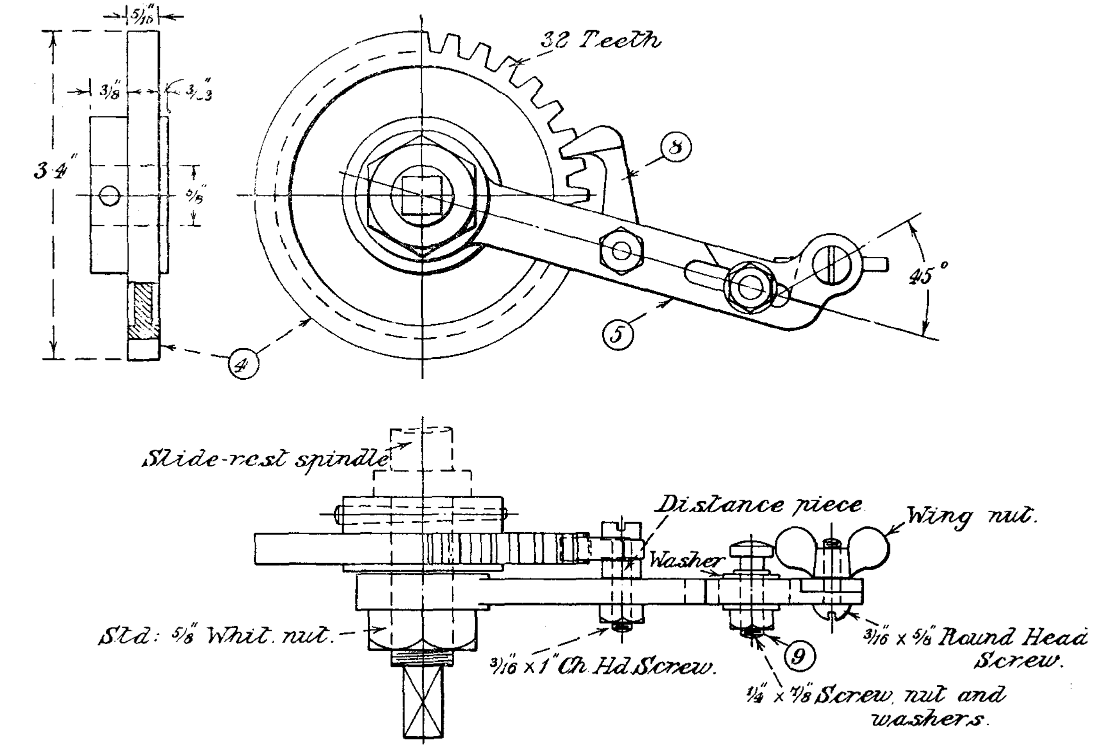


Fig. 1. Assembly of Slide-rest Attachment.

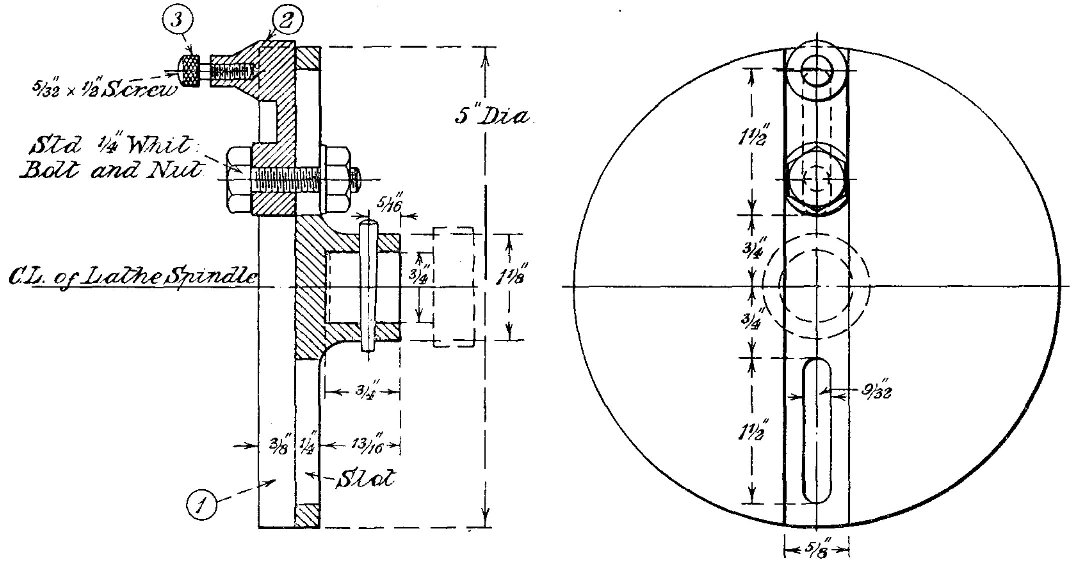


Fig. 2. Assembly of Headstock Attachment.

GENERAL ARRANGEMENT OF ATTACHMENT FOR CROSS-SLIDE FEED.

p = Pitch of screw on slide-rest driven by ratchet wheel.

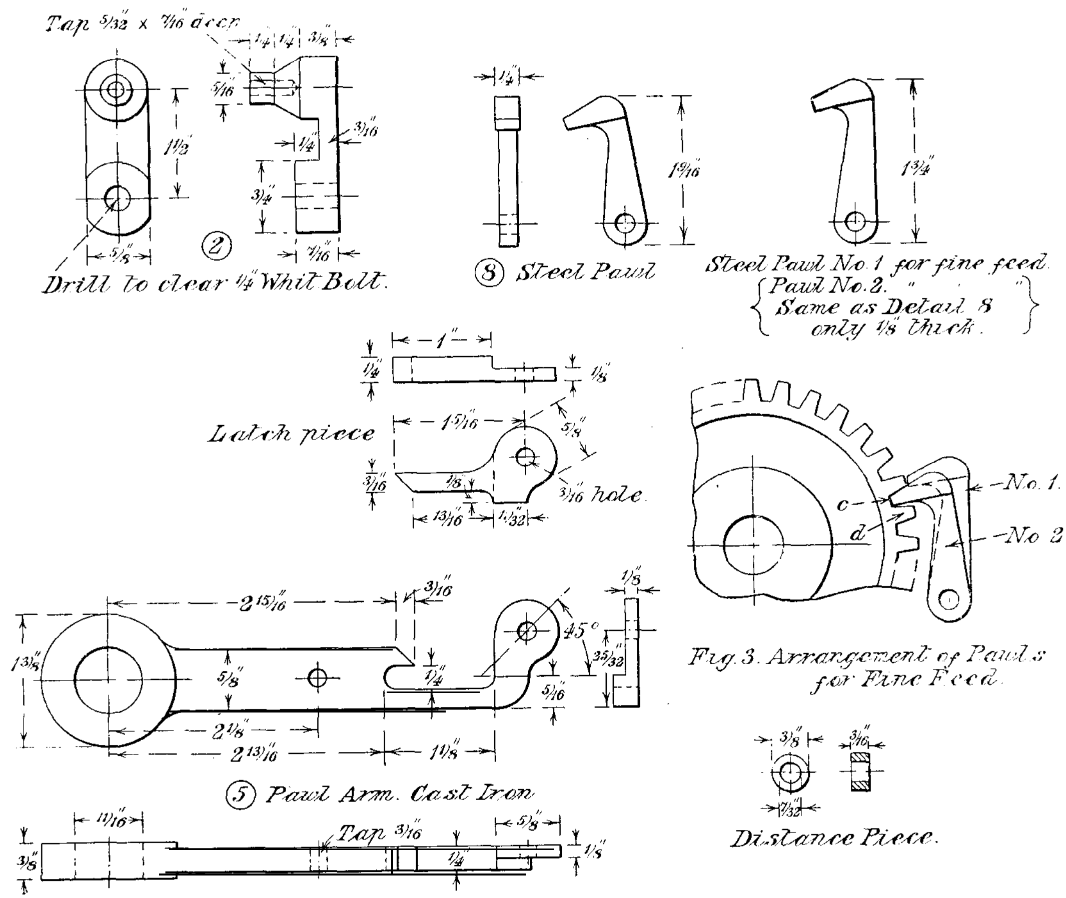
One turn of the screw of the cross-slide will move the tool by an amount equal to p and the fraction of a revolution caused by one stroke of the arm will be $= \frac{n}{d}$.

The pitch of the screw is $\frac{1}{10}$ in this case, the 20 teeth for each stroke gives :—

$$\frac{20}{32} \times \frac{1}{10} = \frac{20}{320} = \frac{1''}{16} \text{ feed.}$$

As the distance varies so does the lift of the arm vary, and also the number of teeth the ratchet wheel is moved by the pawl.

In the case where a fine feed is required we used a half-pitch ratchet, as shown in Fig. 3. The movement is similar to the other, but it



Details of Components of Attachment for Cross-Slide Feed.

reciprocal of the number of threads per inch on the slide-rest screw.

Applying the formula3 we obtain :—

$$l = \frac{n}{d} \times p \text{ or } l = \frac{5}{32} \times \frac{1}{10} = \frac{1''}{64} \text{ feed,}$$

5 teeth for every stroke of the arm.

When the pawl is set to move the ratchet wheel 10 teeth for each stroke gives :-

$$\frac{19}{32} \times \frac{1}{10} = \frac{19}{320} = \frac{1''}{32} \text{ feed}$$

will be seen that two pawls are used. When the ratchet recedes on the back stroke pawl No. 2 climbs to the top of the tooth ***d*** and pawl No. 1 drops into the tooth at c; on the forward stroke the wheel is carried one-half ($\frac{1}{2}$) pitch of tooth further on than on the preceding stroke. On the next back stroke the process is reversed, No. 1 climbs, the tooth No. 2 drops into the space. Details of the two pawls for the fine feed are given on drawing. The two cast-iron pulleys were fitted to hang from the overhead gear, the best position being found by trial.

The Drawing Competition at the "M.E." Exhibition.

This competition was a new feature introduced partly to encourage mechanical and illustrative drawing in its application to mechanical work as a hobby and partly upon the idea that model enthusiasts not in possession of tools and workshop facilities might find a substitute for mechanical work in making a drawing and having an opportunity to enter it in a competition. The plan was tried as an experiment, and from the results is likely to become a regular item in the series of MODEL ENGINEER Exhibitions. The drawings, for convenience, were required to be on paper or mount not exceeding 22 ins. by 15 ins. or 15 ins. by 11 ins., to be the unaided work of the competitor-, but might be own design or a copy. There was no restriction as to age or occupation The drawings were to show either a model of any kind or any tool or piece of mechanical, electrical or scientific apparatus of a kind used or produced in a model engineering workshop. Drawings of large engines or machines were not invited. Pencil, ink or colour- might be used and the drawings would be judged primarily on their merits as examples of draughtsmanship and not on the technical points of the subject represented ; tracings were not eligible. A considerable amount of latitude was thus allowed by these conditions, and as the possible number of awards was not limited competitors had a very fair opportunity. The response was decidedly encouraging, 36 entries were sent in, the drawings ranging from a freehand sketch of a hand tool and copied drawings of engines to water colours and oil paintings and elaborate working drawings. The competitors varied from juniors at school to those of mature age, and occupations included a civil engineer, a saddler, an architect, a fitter, a civil servant, a typewriter mechanic, a patent agent's assistant, a hoot-shop assistant and a patternmaker. The judges awarded one silver and one bronze medal, sixteen diplomas of 1st, 2nd and 3rd grades, and ten money-value awards of a total of £5 10s. The work of the juniors was very creditable when one considers how little in the way of craftsmanship or drawing the average lad of 14 to 16 years of age is able to or actually does accomplish. A similar remark is applicable to the work of the competitor, an apprentice, who sent in a drawing of a triple expansion marine engine, which well-deserved the award given of a second class diploma—"Highly Commended for Neatness." There are many apprentices who are unable to make any sort of a mechanical drawing. The fitter who Sent in a drawing of a model petrol engine is deserving of praise, he likewise is awarded a second-class diploma for neatness ; and the saddler, only 18 years of age, by the way, was awarded a second-class diploma plus an award of fifteen shillings in money value for a working drawing of a model locomotive boiler, remarkably complete in dimensions, figures and details. With regard to the medallists, the silver was awarded to an exceptionally good scale drawing for a model articulated locomotive, original design, coloured and drawn with an excellent degree of neatness and the views well arranged ; the bronze was awarded to a competitor who sent in a coloured working drawing of a spiral dividing head for a 3½-in. Drummond lathe. This showed a very good standard of draughtsmanship with adequate views and sections, rendering the design understandable and clear for the mechanic. This competitor deserves congratulation on being able to make such a drawing at 20 years of age. A good standard of draughtsmanship was shown in the drawing of a 1-in. scale model G.W.R. locomotive sent in by the patternmaker; this was awarded a first-class diploma-"Very Highly Commended." The pictures were welcome and gave variety to the competition, neither can be regarded as of high standard yet both are commendable and have merit for what they are intended to be. Taking them in order of number the first is an oil painting of an actual model 2—6—0 express locomotive, with outside cylinders depicting the model as if it was a full-size engine standing under steam in a railway yard ; the pictorial effect in general is good and deserving of the second-class diploma awarded for this qualification. The other picture is a water colour painting of a model horizontal Tangye-type steam engine, the colouring is bold and the engine stands out well, the competitor has made a good attempt at a difficult subject and deserves the diploma awarded to him, "commended for pictorial effect." A very good example of pencil-working drawing for a model horizontal engine was sent in by an agricultural engineer, the draughtsmanship of this is exceedingly neat and the colouring nicely done ; he gained a second-class diploma-"Highly Commended for Neatness." A design in pencil for a model compound marine engine sent in by an apprentice fitter 17 years of age is quite commendable, as junior effort ; it was awarded ten shillings, money value. There were two illustrative drawings of special character-one in pencil, showing an electro-magnetic motor, from a competitor 19 years of age, is decidedly good and has received a Second-class diploma. The other is quite a good example of a drawing intended to show the appearance of a model power boat and the steam plant ; the detail, colouring and shading are simple and just sufficient for the purpose intended. Award : second-class diploma—"Highly Commended for General Effect."

A Design for a Model Compound Condensing Steam Engine.

By " Axle "

NO model looks better, I think, than a well-made compound steam engine. The following is the result of an attempt made by the writer to furnish himself with working drawings from which to make a model condensing engine. In designing the model, drawings of a set of compound marine engines (with H.P. and L.P. cylinder bore, of 13 ins. and 26 ins. diameter, and a stroke of 20 ins.) of a kind usually installed in small coasting steamers were kept in view as a type upon which to base the design. Although not an exact copy of such a class of engine, an attempt has been made to retain the same general appearance. A good working model is essentially a compromise, simplicity of design and appearance being of first importance. Also a reasonable efficiency is expected of an engine built to be one that will do something more than merely " go."

The H. P. cylnder bore is 1-3/4 ins. and the L.P. cylinder 3 ins., giving a cylinder area ratio of 2.9: I. In order to keep down the over-al height of the engine a rather short stroke of 2 ins. is used. A working pressure of 100 lbs. per square inch, giving 500 as the maximum revolutions per minute, has been assumed. The engine is fitted with the usual pumps driven by levers operated by the L.P. engine. Liberal bearing surface has been given to the working parts and means of adjusting them provided wherever thought necessary.

The valve gear *is* of the overhung type, with all-round reversing gear. The H.P. engine is fitted with a plain piston valve and the L.P. with a flat valve. The condenser is fitted with 83 tubes 1/4 in. diameter. The bedplate is cored out to form a chamber connecting the condenser and air pump. The circulating pump is double-acting and forces water into the condenser at the L.P. end and discharges at the other, as it was not thought necessary to fit a partition in the condenser cover to obtain a return flow of the cooling water. Figs. I and 2 show the general arrangement of the model.

In describing the details of the engine, I will consider the parts requiring castings first, commencing with the bedplate, which is shown in Fig. 3. The patterns should not be difficult to make. The several facings on the upper surface are all in the same plane. The bedplate has an extension which carries the air-pump. A chamber is cast in this extension, which connects the air pump and condenser. A core box will be required to form the core in moulding this chamber. The pockets for the main bearings and the recesses at the front and back should also be cored out. The mould should bc arranged to part at the underside of the top flanges of the casting.

The bedplate should be cast in good cast-iron, allowing I-16th in. on all the surfaces to be machined. The casting should be free from blowholes and spongy metal. Having obtained a suitable casting, mark it off carefully to the dimensions given in the drawing in the following manner. Set the casting up on an angle-plate so that the upper surface of casting stands in the vertical plane with the underside towards the angle plate and with the front of the casting horizontal. The casting having been previously whitened should have the centre lines corrcsponding with the front columns, main bearings, condenser, and air pump plainly marked with the scribing block sliding on the marking off table. As these centre lines will be required as guides in erecting the engine they should be permanently marked in with a fine centre punch. The centre lines at right angles to the above-mentioned centre lines may now be marked in, applying a square for this purpose. Having obtained the chief centre lines the other machining marks ran be located by compasses. The holes for the front columns, main bearing bolts and condenser fixing bolts can now be marked in. To form a centre for the hole corresponding with air pump barrel, a wooden plug upon which is attached a piece of tinplate can be fixed in the casting. The machining marks for the upper surface and depth of pockets can be marked on the casting if the scribing block is applied to the angle plate.

The first machining operation should be the planing of the underside of the casting, which should be bolted upside down on the table of the shaping machine. A cut should be taken across the bottom to form a flat surface for the heads of the main bearing bolts. The bottom flange of the casting through which the holding bolts are drilled should be just cleaned up. The casting should now be turned over in order to machine the top and the pockets. As before-mentioned, the upper facings being all in one plane, they can be machined all together. The casting should be secured to the shaping machine table so that the sides of the pockets can be machined at the same setting. The table should now be turned through 90 degs. so that the pockets can be machined along the bottom and other sides. The seating for the air pump barrel can be bored out with a cutter bar after mounting the work on an angle plate attached to the lathe saddle. The casting should now be drilled

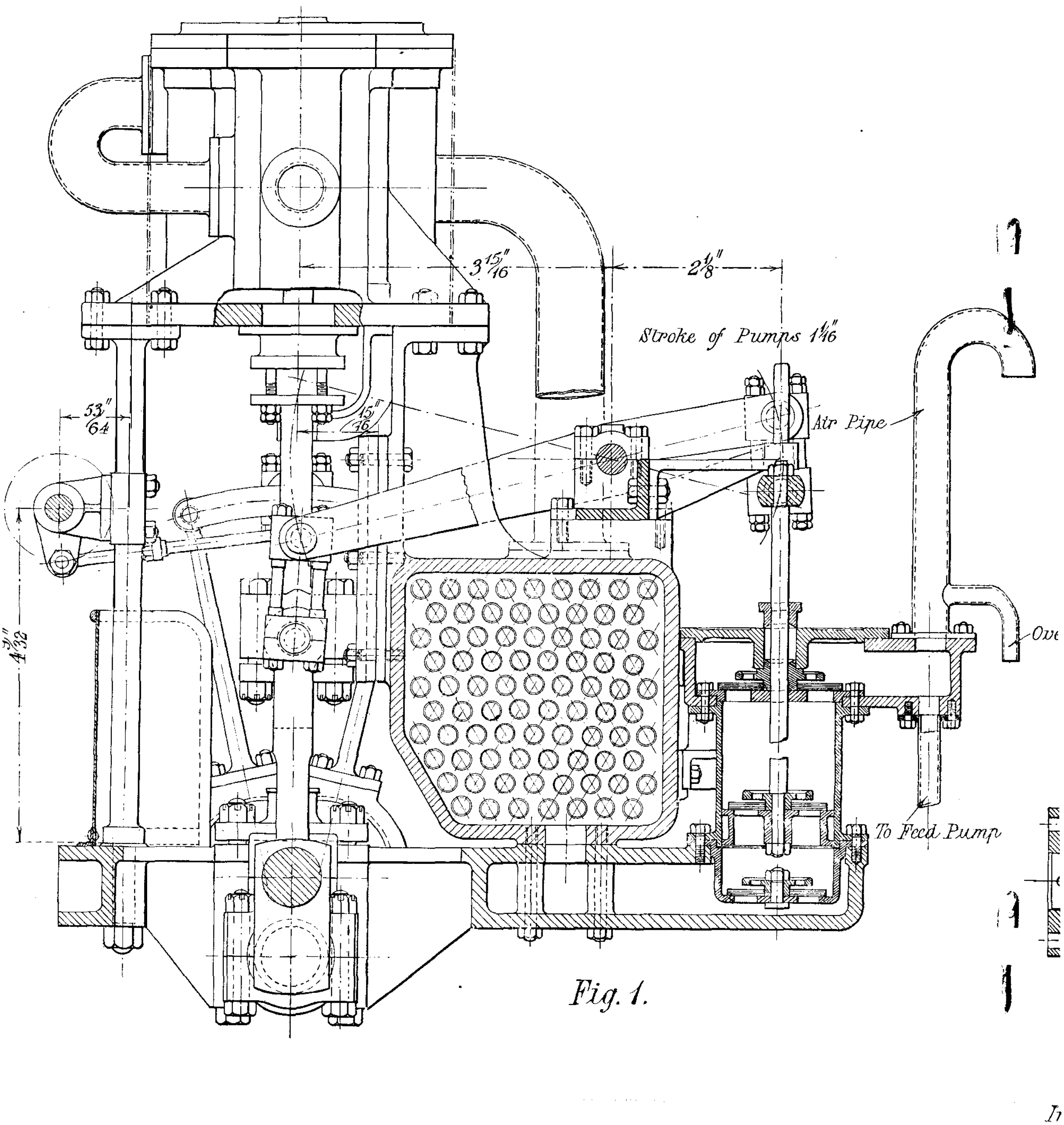


Fig. 1.

GENERAL ARRANGEMENT DRAWINGS OF A MODEL COMPOUND CONDENSING STEA

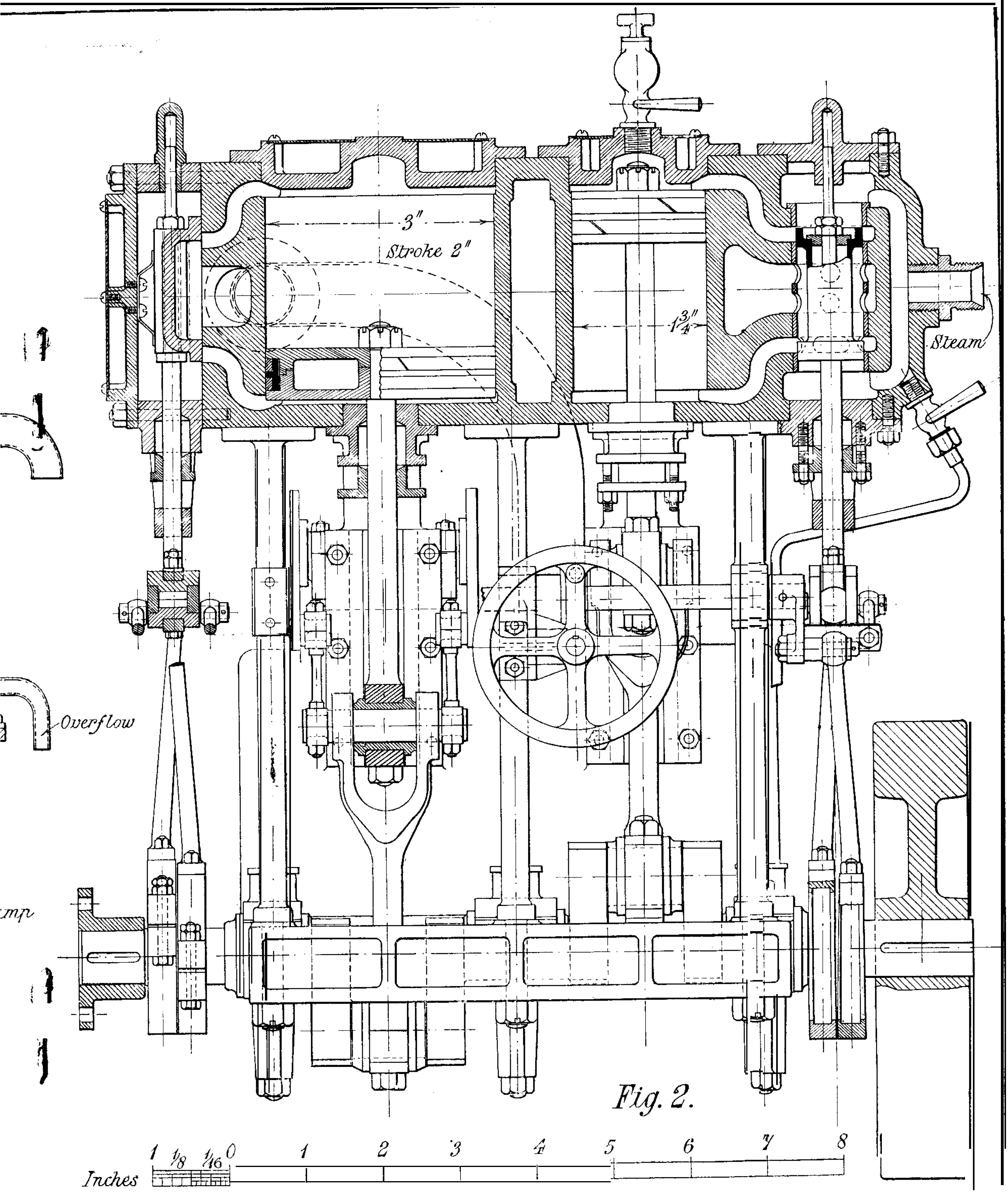


Fig. 2.

ENSING STEAM ENGINE WITH CYLINDERS 1¾-IN. AND 3-IN. BY 2-IN. STROKE.

and tapped. The holes for the main bearing bolts are 15-64th in. diameter drilled right through the casting. Studs can, of course, be used, holes tapped 7-32nd in. diameter and $\frac{1}{2}$ in. deep being provided for this purpose. The holes for the front columns are 5-16th in. diameter and should be drilled perfectly square with the upper surface ; 8 holes 9-64th in. diameter arc drilled for the studs holding the condenser to the bedplate. The four centre holes arc drilled right through the casting, and should be faced on the underside with a 5-I6th-in. pin drill, to give a flat surface for the nuts. The air pump barrel is secured to the brdplate with six No. 5 B.A. studs, and the facing should be drilled and tapped for the studs at least 7-32nd deep. The holes for the holding-down bolts are 13-64th in. diamctcr to suit No. 2 B.A. bolts, four holes being drilled at the front and three at the back of the casting. The casting should be filed up along the edges of the flanges and the crank races The port leading to the air pump should be filed up to size if necessary and the sharp corners should be taken off the pockets for the main bearings.

The H.P. and L.P. cylinders are cast tog:cther. To facilitate the machining of the L. P. valve face, and to simplify the casting, the I..P. steam-chest is attached as a separate casting to the main portion of the cylinders by means of studs. Core hoses will be required for forming the ports which art cast in the cvlinders. The bottom of the casting is perfectly-flat. The feet for securing the cylinders to the front columns and condenser are extensions of the bottom flange and have been arranged to give the least trouble in mouldinc. The piston-rod stuffing boxes are separate from the cylinder casting, so that the cores for the cylinder boxes can be supported at both ends. With the exception of the core boxes little difficulty should be encountered in the making of the pattern? for the cylinders.

The cylinders should be made of close-grained cast-iron, care being taken to obtain a clean, sound casting. The casting should be accurately marked off to the dimensions given in Fig. 4.

The casting should be mounted on the faceplate in the lathe and the bottom surface machined right across. This machined face will then form a flat true surface for setting up the casting for further machining.

It is probable that a lathe large enough to swing the casting when boring the cylinders will not be available, so that the boring out will be done with a boring bar. If a lathe big enough to take the casting set up on a faceplate is available (a gap-bed lathe of 5-in. to 6-in. centres at the least will be required), then the casting should be attached with the machined side towards the faceplate and resting upon two parallel strips, so that the faceplate will clear the tool when the holes for the stuffing hoses are being bored out.

The casting should be set up for boring out the H.P. steam-chest first. As the casting will be considerablv out of balance when rotating in the lathe a suitable balance weight should be placed on the faceplate opposite the casting.

The rough surface of the hole should first be removed with a stiff flat drill, say $\frac{7}{8}$ in. diameter, which could be followed up with a 1- 16th.in. diameter twist drill. The finishino cut should be done with a hooked boring tool and care should be taken to ensure a smooth and parallel hole If a 1 in. diameter parallel reamer is available the bore should be finished off with it, but reamering is not essential. The top and bottom of the steam-chest should be counter-bored to suit the steam-chest covers. The sharp corners should be removed by chamfering at 45 degs. to say 1-64th in. to I-32nd in. deep.

The casting should now be moved on the face-l)late and set true for boring out the H.1'. cylinder. A fairly heavy cut should be taken as a first cut so as fo get well below the hard surface. and using as stiff a boring bar as possible. The cutting speed should not be too high and fairly light cuts should be taken after the first cut. The finishing cut should be done with a broad, well-rounded tool. A hooked tool will be required for counter-boring the bottom of the cylinder to I-16th in. larger in diameter. A cut can be also taken across the bottom, but it is not necessary if the casting is clean and cast to the correct dimensions. The top of the cylinder is counter-bored 1-16th in. larger in diameter to suit the H.P. cylinder cover. The bore can of course be ground to size, but as high a degree of precision as necessary should be obtained without grinding. The hole for the stuffing box should be bored out at this setting. A similar procedure should be followed in boring out the L.P. cylinder. The top of the casting should be machined right across at the same setting.

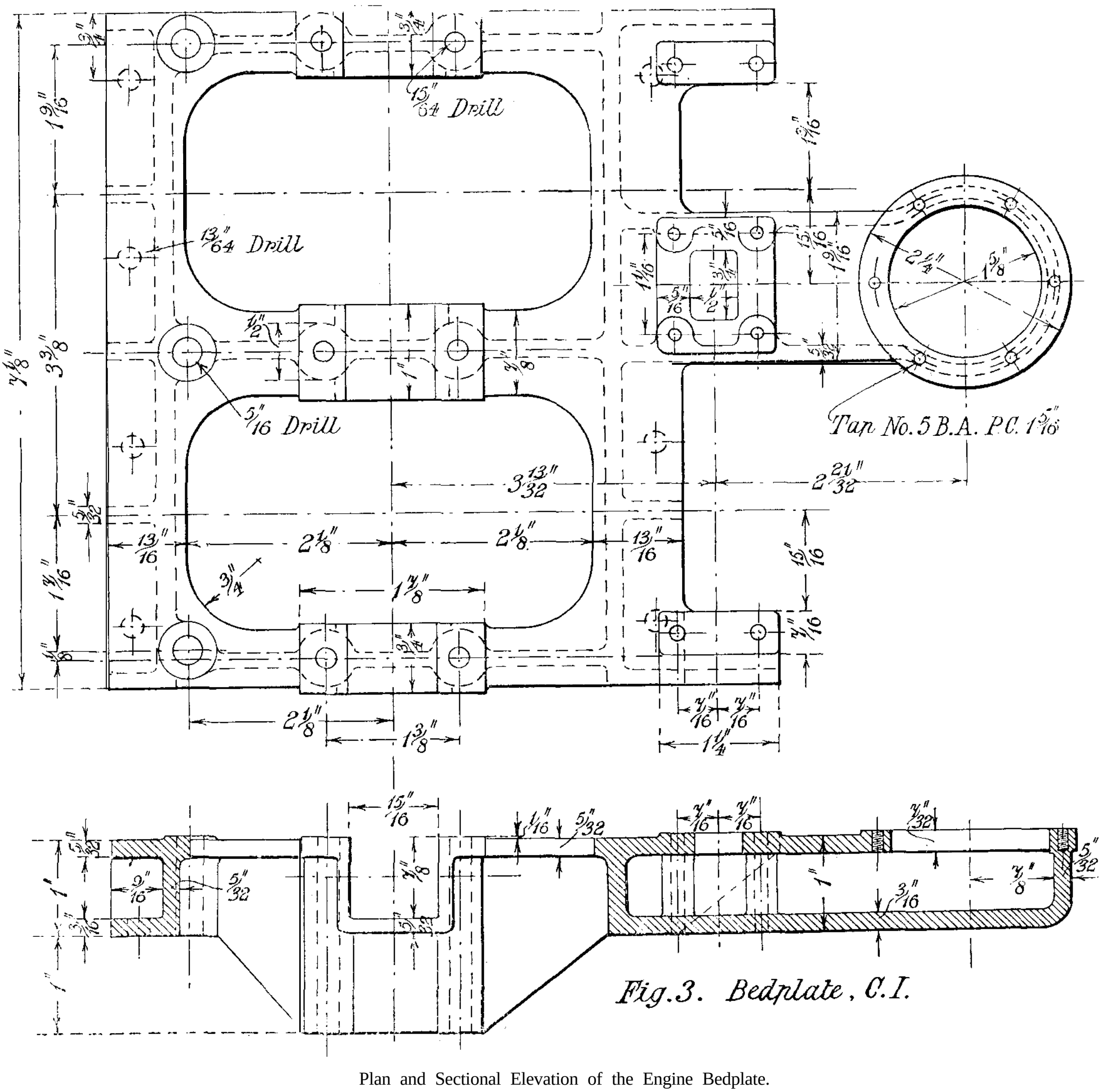
The L.P. valve face can be machined either in the lathe or in the shaping machine, or if the maker is skilful with the file and scraper, then these tools may be used. In any case the scraper will probably be used in bedding the slide valve down to its face. This, however, will he discussed later.

Should one's lathe be too small to carry the casting on the faceplate, then the casting should be bolted to the lathe saddle. The casting is $2\frac{3}{8}$ ins. wide from the centre on one side, so that it should be easily set up on a $3\frac{1}{2}$-in. centre lathe.

The casting should be bored out with a $\frac{3}{4}$-in. diameter boring bar held between the lathe centres and passing through the bottom of the cylinder to be bored. Should the lathe not be one possessing a sliding saddle, then the casting

should he bolted directly on to the lathe bed, and the traverse of the tool obtained by arranging the tool holder to slide along the boring bar. **This can** be done in the following way. The circular tool holder is bored out a good sliding fit on the boring bar and is tapped to suit a lead-screw passing through it. and which runs one tooth every revolution of the bar by means of a tripping device fixed to the lathe bed.

The steam inlet boss is tapped $\frac{3}{8}$-in. B.S. pipe, to suit the steam-pipe union. The boss should be faced with a I-in. diameter pin drill before tapping. The exhaust passage from the H.P. cylinder is a $\frac{1}{2}$-in. diameter drilled hole. The



Plan and Sectional Elevation of the Engine Bedplate.

parallel to the boring bar. The lead-screw is held at the front end by means of a collar, in which the lead-screw can rotate but not move endways. By rotating the lead-screw (which has, say a $\frac{3}{8}$-in. Whitworth thread); the tool-holder is moved along the boring bar. To cause rotation of the lead-screw a small star wheel is mounted at the front end and which is moved

boss for the H.P. exhaust pipe should be faced either in the lathe or with a pin drill, and also be tapped for the studs securing the exhaust pipe. The exhaust passage from the L.P. cylinder is a $\frac{5}{8}$-in. diameter hole drilled obliquely through into the exhaust port. The exhaust pipe boss should be faced and tapped for the studs securing the exhaust pipe.

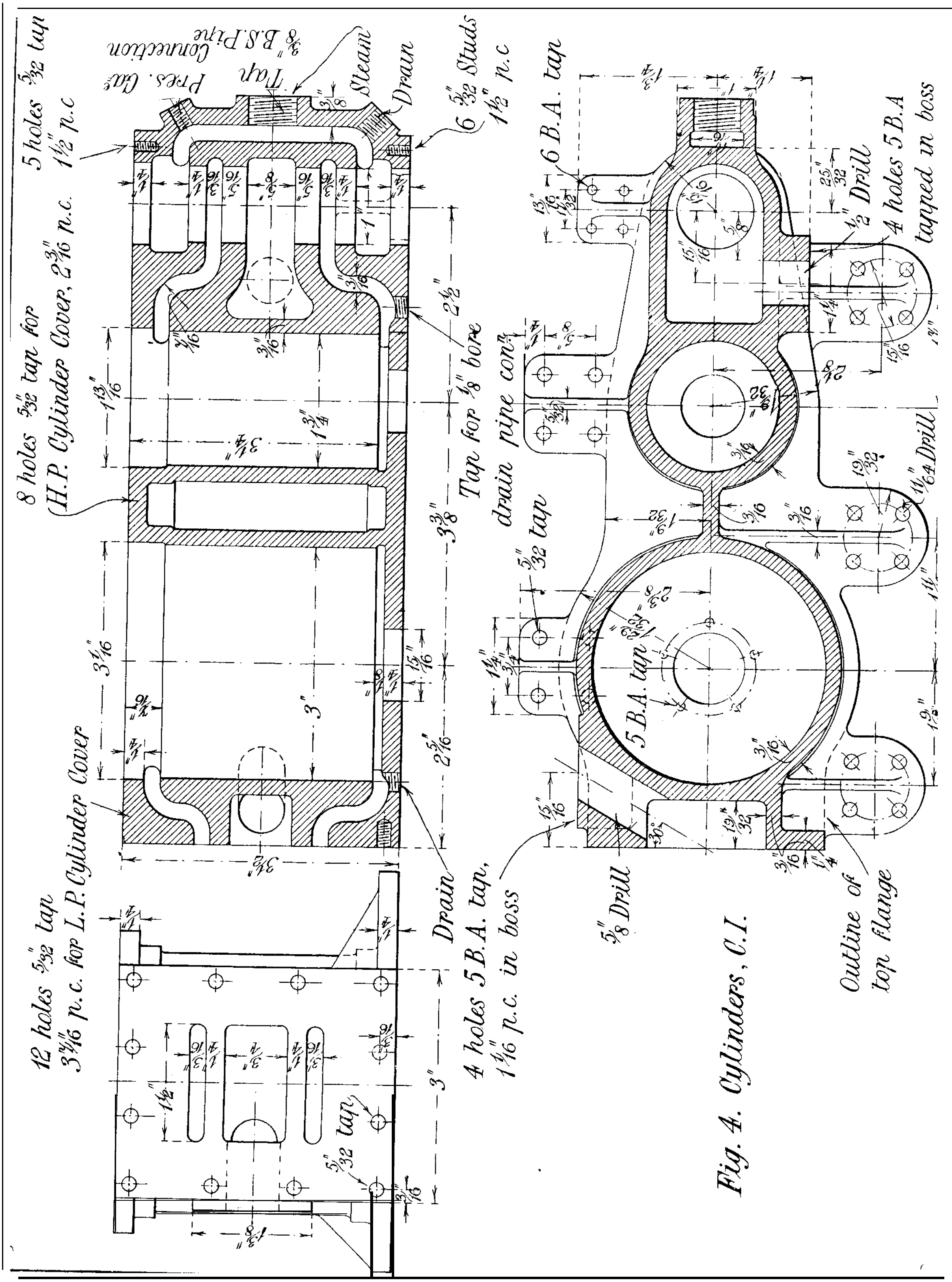


Fig. 4. Cylinders, C.I.

The tapped holes for the H.P. and L.P. cylinder covers and steam-chests will be dealt with later, as they should not be drilled until the parts to be attached to the cylinder are ready for iitting.

Three holes for the drains are tapped $\frac{1}{4}$ in. diameter and 30 t.p.i. in the cylinders at the bottom of the steam ports, as shown on the drawing. The holes for the screws securing the lagging are tapped No. 8 B.A. and $\frac{1}{4}$ in. deep, and are situated $\frac{1}{8}$ in. from the edges of the casting and spaced about $1\frac{5}{8}$ ins. apart as symmetrically as possible around the flanges.

The body of the condenser is shown in Fig. 5. It is made of gun-metal, and the interior is cored out. Having obtained a good casting, it should be prepared for marking off. First lightly machine the two faces of the columns upon which the guide plates fit, machining the two faces at the same time if possible to ensure that they are parallel and in the same plane. The casting can now be set up on the surface plate and marked off from these accurate surfaces very carefully.

The facings for the guide plates may now be machined down to the right depth. The ends

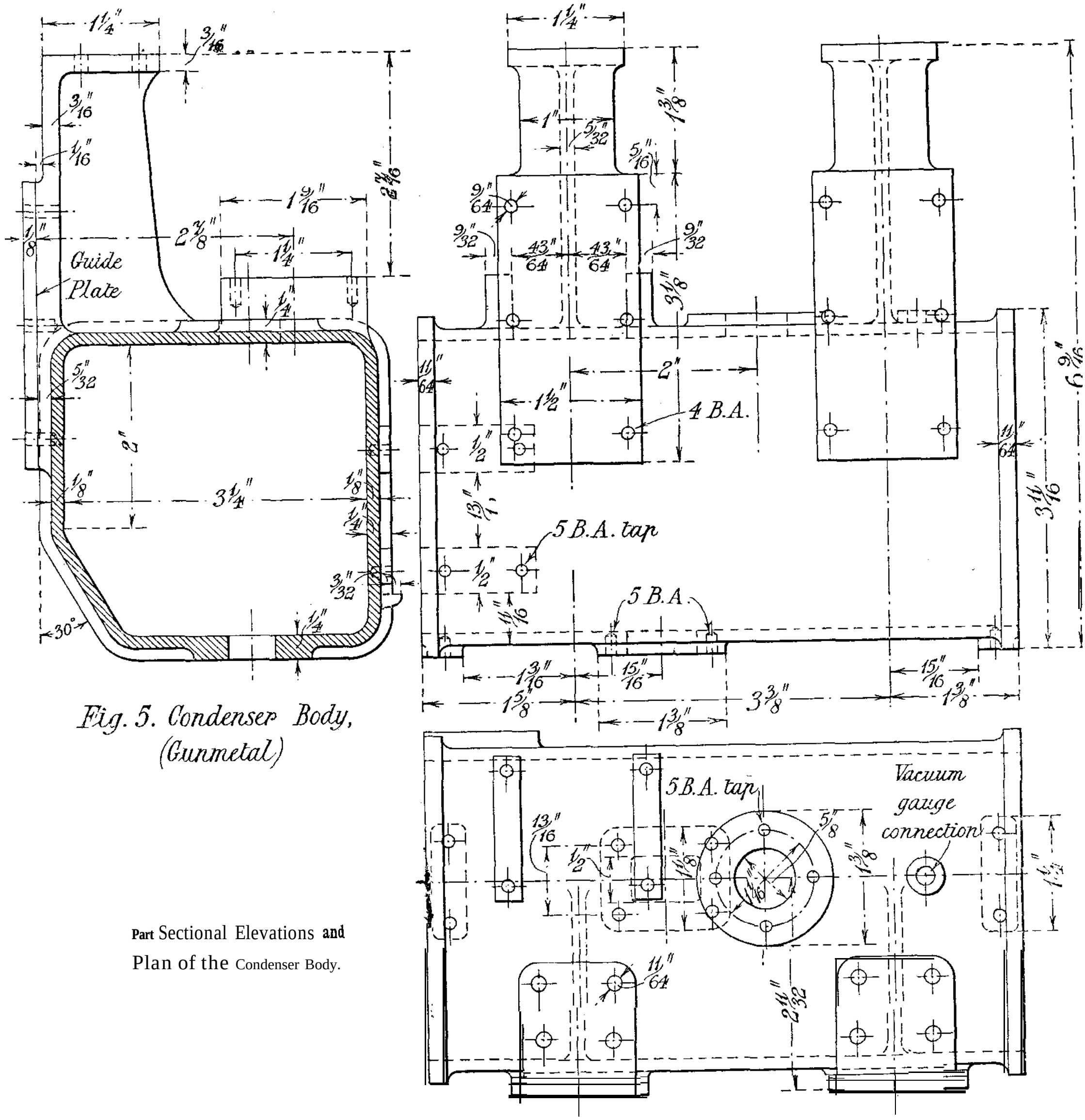


Fig. 5. Condenser Body, (Gunmetal)

Part Sectional Elevations and Plan of the Condenser Body.

of the casting should be faced next. This may be done in the lathe. Secure the casting on an angle plate with guide faces downwards and with one end towards the faceplate. The outer end may then be faced across. The casting may now be turned end for end and again machined. The tops of the columns, the feet carrying the bearings for the pump levers, and the facings at the back and bottom of the castings, can be machined at one setting in the shaping machine. This, of course, depends entirely upon the tools at the maker's disposal, and many of the parts which would be usually machined can be finished with the file and scraper when in skilful hands. The guide plates are secured to the columns with four No. 4 B.A. studs and two No. 4 B.A. bolts in each, and the columns should be drilled and tapped accordingly.

The holes for the screws holding the bearings for the pump levers and the bolts holding the cylinders should be left undrilled until the time comes for fitting up these parts.

The condenser body should now temporarily be clamped to the bedplate, so that the holes in the bottom may be marked off for drilling and tapping. The centre lines on the condenser should register accurately with those on the bedplate, and the guide surfaces should be perfectly parallel and square to the main bearing pockets before the holes are marked off. Eight No. 4 B.A. studs secure the condenser to the bedplate. The boss on the top of the condenser to which the exhaust pipe is attached is drilled $\frac{5}{8}$ in. and also tapped No. 5 B.A. for the four screws securing the exhaust pipe. A small boss is provided which is drilled and tapped to suit the connections for attaching a vacuum gauge

(To be continued.)

Watt Colliery Engines.

AN interesting correspondence between Boulton & Watt and a Swansea firm, written between the years 1779 and 1781, has recently been published in South Wales. It relates to proposals for the erection of a colliery engine, and James Watt informs his correspondent that he proposed to install an engine with a cylinder 52 ins in diameter with an 8 ft. stroke, making 8 strokes per minute. He estimated that this would require about 64 bushels of coal per 24 hours, provided that a proper " boyler, such as are used in Cornwall " were employed. It has been estimated that this engine would have an output of about 30 b.h.p., with a coal consumption of something less than 7 lbs. per b.h.p. hour. Now, Watts' engines were erected on a profit-sharing basis under which his firm received the value of one-third of all the coal saved, and as a Newcomen engine of the period would consume nearly 18 lbs. of coal per b.h.p. hour, it will be seen that his profts would be very considerable.

Radio Engineering.

The Licence Difficulty : A Suggestion.

In view of the apparent deadlock at present existing concerning the issue of licences for the reception of wireless to those amateurs who desire to construct their own apparatus, the following suggestions are put forward as a possible solution of the difficulty which undoubtedly exists.

There are at the moment three distinct classes of wireless amateurs :-

(1) Those who desire simply to receive broadcast telephony and are content to purchase complete sets bearing the B.B.C. mark of approval.

(2) Those who desire to receive broadcast telephony, but who prefer to construct their own apparatus of more or less stereotyped design and from components of what are practically standard pattern.

(3) Those who wish to construct, or assemble, their own apparatus for experimental work of greater or lesser elaboration, and to whom broadcast telephony is probably a secondary consideration.

As matters stand, those in the first group are easily and simply catered for by the issue of broadcast licences from all post-offices. The P.M.G. and the B.B.Co. each receive their due share of the fees paid and the licencee can set to work. At the same time, there is a growing feeling that in some instances the manufacturors forming the B.B.Co. are charging prices for their products which smack of " profiteering."

Those in the second group form the difficulty. They are not true "experimenters "-though many of them may later become such-and the paragraph in Form 43a requiring them to state previous experience in the use of wireless apparatus hits them badly. So also does the paragraph requiring them to state the nature of the experimental work they desire to conduct. Many of them have no wish to be classed as experimenters, and the real earnest experimenter is rather put about that such individuals are placed upon the same plane as himself.

And this brings us to the third group, the members of which are suffering most of all, as until the difficulty concerning the second is settled, those in the third must wait.

It must have been foreseen that some such position nould arise, and the blame for the present deadlock must be placed largely upon those who circulated such glowing pictures of the future of wireless—more particularly of broadcasting-without, at the same time, giving' the general public a statement of exactly what they might and might not do. Consequently thousands, from schoolboy to grey-

beard, commenced to prepare for broadcasting, and there are now hundreds of firms-manufacturers and retailers—working day and night upon the supply of parts and components; and, more impressive still, several periodicals the main objects of which are to solve the difficulties of, and offer advice to, this very class of so-called experimenter, and to provide advertisement for members of the B.B.Co. side by side with the retailers of small parts who, after all, bring no revenue to the B.B.Co.

The present unsatisfactory state of things is breeding a growing host of illicit stations. Every reader of these lines, in common with the writer, knows of. many who have built, or are building, a set, who have no licence, and will not, apparently, trouble about one, because, as they truly say, a broadcast licence is of no use to them 'and they cannot hope to obtain an "experimenter's" licence. There is no use in blinking what are hard facts.

Now, what is the solution to be? The writer would suggest leaving the first and third groups of amateurs as they are. If anything, the experimenter's licence, as it stands, should be impossible to obtain unless evidence of technical knowledge were forthcoming. A great deal of the present-day interference would then automatically cease.

In order to meet the present situation the writer would suggest the issue of a modified broadcast licence calling it a "constructor's licence" or some other title which should be self-explanatory. The procedure would be as follows: Let individual construct his set, and on its completion let him present it for examination (for approval or disapproval) to some competent and authorised examiner. The chief P.O. engineer of the town or district should surely be competent to pass a final opinion on a set of the kind under consideration. Or, alternatively, the officials of the local wireless society or association might be invested with such powers. Upon approval from some such recognised authority, the constructor, armed with a signed statemenr to that effect, would proceed to the nearest post-office. obtain his licence, pay his fee for the same, and at the same time and office purchase an official label, paying a fee for the same appropriate to the nature of his set. This label would be affixed to the set and there the matter would end. The P.M.G. mill get his share of the licence fee, and the B.B.Co. will get their royalty. In addition to this, the small traders will continue to find a market for their wares. Beyond this, the writer believes there will also be a greater incentive for the constructor to produce better work. If he knows his set will be rigidly scrutinised he will feel it " up to him" to show something better than he might otherwise put together. The two hundred odd wireless societies might well justify their existence by catering for the would-be constructor by arranging lectures on sufficient theory as will enable him to carry out his constructive work more intelligently than he otherwise might perhaps do. In the writer's opinion, a wireless society which exists simply for listening-in demonstrations is not worth joining. Have demonstrations or experimental research on members' apparatus by all means, but let instruction be the main object of the society.

Finally, it is to be hoped that whenever and however the solution to the licence difficulty is attained the authorities will make it their business to round up and punish severely those who erect and use unlicensed apparatus. Just now there is a growing feeling that amateurs who are perfectly willing to " play the game " are being coerced into obtaining a broadcast licence against their inclinations. After all, the broadcasting scheme was set on foot to suit the public, not ***vice versa.*** The writer is unwilling to believe that such an attitude is intended, or even attempted, but things obviously cannot remain as they are.

* * *

Replies to Wireless Enquiries.

E. H. W. (Funchal).-(1) .01 mfds. and .0003 mfds. respectively. (2) Inductances wound on cylindrical formers. (3) Either in the earth lead or through a transformer inserted directly in the grid lead.

J. G. T. (Doncaster).-Our correspondent asks for a useful three-valve circuit.

C. A. (Thornton Heath).-Loud speakers cannot be used with crystal detectors ; some form of relay must be employed, the " Brown " relay being specially good.

G. E. L. (Birmingham).—(1) You will require *two* condensers, both variable. For the aerial circuit use .0001 mfd. ; for the secondary, .0002. (2) About 1,200 metres. (3) Primary, 62 yards ($\frac{1}{2}$ lb.) ; for secondary, 80 yards ($\frac{1}{4}$ lb.). Your sketch is not quite correct; you should put the aerial condenser in series with the inductance, and not in parallel, as you have shown it.

G. B. C. (Enfield).-Your aerial and earth are quite O.K. There is no need to place a switch as shown in your sketch, though it would function admirably. Place it indooss just where the lead-in and earth are brought to your set. The two wires are brought to the switch and from this to two terminals. When not in use the aerial and earth are joined directly by this switch. If you care for an extra safeguard, take a short, stout wire from each terminal, letting the ends of the wires be points and about $\frac{1}{2}$ mm. apart. Static discharges will spark across these points, and such sparks should be a warning to cease work and close the switch.

W. H. 0. (Birmingham).-You cannot use a crystal set of any make directly with a loud-speaker; there must be some means of amplifying the rectified signals from the crystal. This is most conveniently done by employing one or more valves as amplifiers. Such a method has the disadvantage that any noises set up in the crystal circuits become very much magnified, and there may be, in addition, noises set up in the valve circuits. Results are rarely satisfactory. The cost of a single-valve amplifier with the necessary valve, accumulator and high-tension battery would be at least £3.

R. M. (Walworth).-The sketch below gives the information you ask for, *viz.*, a 3-valve circuit on the unit panel system comprising H.F., detector, and L.F.

E. J. V. (Manor Park).-Yes. See our book " Wireless Apparatus Making " by A. V. Ballhatchet, price 3s. 9d., post free, from our Publishing Department, 66, Farringdon Street, E.C.4.

F. S. (Shanklin) .-You do not state over what range of wave-lengths you desire to work, so that it is impossible to help you. If you wind the outer tube with about 500 turns of No. 24 wire, and the inner with about 650 turns of No. 28 wire you should have a range up to about 3,000 metres.

R. A. H. (Eastbourne) .-(1) You will require a variable condenser of about .0002 mfd. maximum capacity across your secondary inductance. The circuit, otherwise, is correct. (2) Reference to the maker's list will enable you to obtain the correct coils. (3) Yes ; honeycomb coils are very rarely tapped, the adjustment being made by means of a small variable condenser.

G. D. (Hounslow).—It is very doubtful whether, under the conditions you specify, you would get satisfactory (if any) results with a single-valve circuit. Your aerial is very small and very low. You will probably require at least three valves to give you the results you desire ; and the best arrangement of these will be, one H.F., one detector, and one L.F. As to cost, that will very much depend upon the amount of work you are prepared to put into the set and also upon the quality of its components. If you consider that you will require a tuning inductance (lattice coil preferable), H.F. transformer, L.F. transformer, two filament resistances, two variable condensers, three block condensers, three valve holders, three valves, two pairs of 'phones, a H.T. battery and a 6-volt accumulator of fairly large capacity, you can by reference to advertisers' lists compute the cost of the bare necessaries. Reference to Fig. 51 in " Wireless Circuits " will give you the type of circuit, but you would omit one H.F. and one L.F. valve. Write again if you intend to proceed, saying exactly what you intend doing.

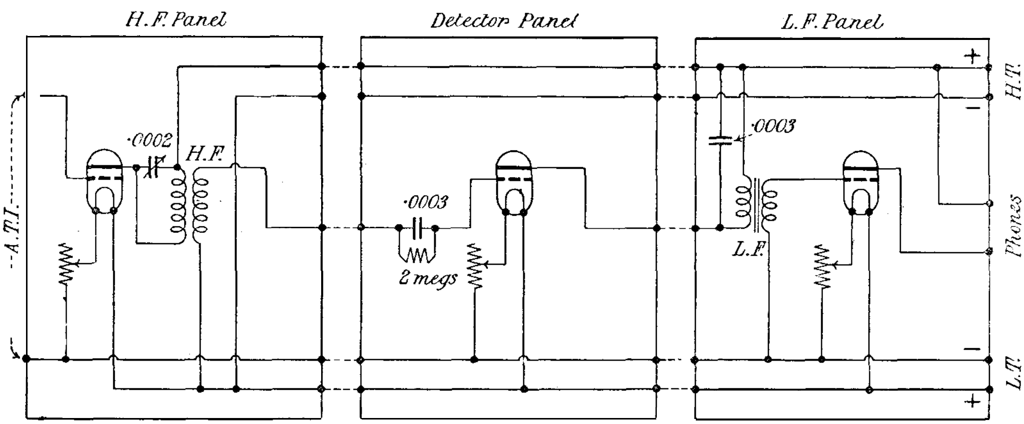


Diagram of Three-Valve Circuit on the Unit Panel System.

C. G. B. (Cardiff).-(1) Without particulars of your inductance coil it is impossible to say exactly what you can do with your set. Most probably you cannot tune down sufficiently low for telephony ; in other words, your coil is too large, and you must get a smaller one. The circuit you propose nould not be allowed by the P.M.G. as it involves reaction. (2) Basket coils would be preferable. You can obtain exactly what you require from any good dealer if you state your exact requirements. (3) Fig. 47 in " Wireless Circuits" shows the principle of H.F. amplification followed by a valve as detector. You can adapt the circuit quite easily by omitting the first valve and putting the 'phones in place of the L.F. transformer shown.

N. K. J. (Ilford).—(1) See p. 90 of " Wireless Apparatus Making." (2) It is regretted that there does not seem to be any such information available. It is hoped to discuss this matter at an early date.

T. H. M. (Chester).---You are undoubtedly suffering from disturbances from the trams, and

it is very unfortunate that there is no real remedy. You might, however, take extra precautions to have perfect insulation at all points, even to insulating the baseboard of your set from the bench.

E. J. V. (Manor Park).-(1) The tubes should be quite suitable, though you do not say how thick they are. Judging from your figures they would seem to be fairly thin, however. The smaller one need be no longer than the larger, shorter would do. in fact. (2) Distance is quite suitable. (3) Wind primary full with No. 24 enamelled, and the secondary full with No. 28 enamelled. (4) You will require a small variable condenser in each circuit to give good results ; capacity about .0005 mfd. Range would then be about 6,500 metres.

J. J. J. (Wanstead).-Your query is receiving special attention.

L. C. D. (Lenzie).—(1) Yes. (2) Yes ; fit a separate control by all means. (3) 4,000-ohm telephones will be quite satisfactory ; 1,000 ohms will be too low. (4) Basket inductances will serve, though the usual spool wound H.F. transformer will be better.

L. S. (Hampstead).-You are asking the impossible. It has been stated on more than one occasion that you cannot use a loud-speaker in conjunction with a crystal detector. If you wish to experiment in this direction you might try using a Brown relay.

J. C. (Falkirk).--(~) You can, by adding a suitable horn, amplify the sounds given by an ordinary telephone receiver, but it will not be, correctly speaking, a "loud-speaker." Such instruments are of special design and construction. (2) Ordinary telephones are rarely very successful when re-wound. You might try putting $\frac{1}{8}$ oz. of No. 44 S.S.C. on each magnet pole ; and you will probably require much thinner diaphragms. (3) Samples of wire enclosed are: (1) No. 42, (2) No. 40, (3) No. 38.

W. J. B. (Leytonstone).-Use the three coils you have. The principle is exactly the same. In the diagram you mention the coil marked A.C.C. is a portion of the A.T.I. but is shown separately as in the original set ; the coupling between the A.T.I. and C.C.I. was brought about by a variometer.

H. W. P. (Leicester).-By using a 50-ft. twin aerial 30 ft. high, and very critical adjustments, you would probably get telephony from Birmingham. Twenty-five miles is a good average range for receiving broadcast telephony on a crystal set. To obtain good results we would advise you to instal at least a one-valve set.

B. M. D. (Levershulme).— (1) No. (2) About 25 miles.

Practical Letters from our Readers.

Draw-bar Pull of Model Locos.

To THE EDITOR OF The Model Engineer.

DEAR SIR,-As a keen model engineer and $\frac{1}{2}$-in. scale loco. enthusiast I always enjoy reading the remarks re $\frac{1}{2}$-in. scale model locos. and their supposed hauling capacity, also the fire tube and water tube controversy. I really think it is time that model loco. engineers adopted a commonsense method of testing the hauling capacity of their engines. The owner of any $\frac{1}{2}$-in. scale loco. could easily construct a special truck with axles running on ball bearings that would only require a few ozs. draw-bar pull to haul a ton weight, so that his claim for the apparently exaggerated hauling capacity of his loco. may be quite justified The only true and correct method of testing a loco. whether it be a model or full size is to weigh the draw-bar pull. Thus a good steaming model with correct motion work, etc., but perhaps light in weight would have the same draw-bar pull as an inferior model of greater weight with better adhesion. All that is necessary to carry out this test is a short length of track on a table or other raised structure. with a small grooved pulley at one end of track and with a scale pan and weights attached to one end of a depending cord, the other end being fastened to the tender draw hook. Then the maximum weight that the loco. will just lift at full steam pressure is the correct draw-bar pull, and the one and only true measure of a loco's. efficiency.—I remain, yours truly,

GEO. H. MERZ.

Insulating Varnish.

To THE EDITOR OF The *Model Engineer*.

DEAR SIR,—Referring to the article on this subject in your issue of January 4, the views expressed therein are eminently practical and accurate. The difficulty, however, which confronts amateurs in using a stoving quality of insulating varnish is practically insurmountable, consequently they are obliged to use an air-drying varnish. This, in order to obtain most satisfactory results, should be of high dielectric and non-hygroscopic quality ; many of the so-called shellac varnishes offered to amateurs are diluted with rosin and soft gum, and to this may be attributed some of the unsatisfactory features mentioned in your article.

For the ordinary requirements of amateurs, pure genuine shellac varnish will, speaking generally, fulfil all purposes necessary, provided care is taken that the work on which the varnish is to be applied is free from moisture prior to application and that the bottle con-

taining the shellac varnish is kept tightly corked, also stored in a dry place.

To meet the convenience of amateurs I am in a position to supply, put up in small bottles or tins, *viz.*, (1) genuine pure shellac spirit varnish ; (2) quick-drying golden varnish (similar in essential properties to the first mentioned but heavier bodied) ; (3) air-drying insulating varnish. This latter takes *twelve* hours to dry, and if the work in hand permits, is strongly recommended on account of its far superior insulating properties and higher dielectric resistivity.-Yours faithfully,

J. BATES.

Building Working Model Traction Engines.

To THE EDITOR OF *The Model Engineer.*

DEAR SIR,—I see in the issue for December 28 a letter from a correspondent who signs himself C. S. G., and is asking for information re a model traction engine. As no one has replied I should like to say a few words on the subject.

I think I may claim to be one of the oldest makers of model tractions, having completed my first one in 1887 at the age of 18.

Now, Mr. C. S. G. says he does not want to pay above £10 outside ; well, he may be lucky enough to find someone who has a fairly good model and would be willing to sell at the above figure, but even if he is the possessor of good luck he can rest assured that he cannot get even a fairly good one made at anywhere near that price. In the first place a good steaming and safe boiler with necessary mountings will cost at least that sum. I take it he does not want a "dud," which would be liable to blow the house up.

Next, the road wheels, to be anything like the real thing, demand a lot of work in them and cannot be cast from comparatively simple patterns in the way model loco. wheels are. Of course differential gearing can be omitted (steam ploughing engines and rollers having none), but it must have a steering gear of some sort, which even if of the simplest variety adds to the cost ; there must also be a bunker and water tank forming the tender.

Assuming that the boiler uses solid fuel no oil tank will be needed, but as yet we have no cylinder (it is possible to obtain cylinders from stock but they would make an unsatisfactory job, a special one being far the better). This would have to be made to fit the boiler and have regulation and safety valves on top. Now there is still all the motion and travelling gear to be made.

These are a few of the points to be remembered when quoting for a model traction engine, and I think very few people realise the amount of work required in one; a good model railway locomotive can be made much easier.

I should be pleased to help C. S. G. or anyone on traction engines or traction engine matters, either through your columns (if of sufficient interest) or direct.-Yours faithfully,

MALCOLM S. DON.

Model Square Rig Vessels.

To THE EDITOR OF *The Model Engineer.*

DEAR SIR,—With reference to Mr. Clinton's remarks in his letter in December 7 issue. The original model is 40 ins. over-all, 33 ins. waterline, $8\frac{1}{2}$ ins. beam deck, 9 ins. waterline. The stations in the drawing (which was full size) are 3 ins. It appears to have been photographed down to about 2-10ths-in. scale.

Yards shifting when braced up ? I never found this to occur ; the main brace, if properly adjusted, keeps all quite rigid.

It would be most interesting if Mr. Clayton would say if his model is to scale, also if the scantlings, ballast, etc., are also to scale and if the sail area is also to the scale of the real vessel.

Hitherto it has been considered quite impossible for a model built to scale to carry canvas to scale. In the *Sea Lark* model, which fetched £2,000 for Red Cross, I had to give twice the displacement of the real vessel to carry the full sails, studding sails, stay sails, ring-sail, etc., from the waterline. This was an exact model of the real vessel, with all guns, boats and fittings ; below the waterline her displacement was much greater than the real vessel, This model carried her canvas and sailed well.—Yours faithfully, C. STANSFELD HICKS.

Moving-Coil Galvos.

To THE EDITOR OF *The Model Engineer.*

DEAR SIR,—Regarding the article by "G.L.A.," describing a suspended coil galvanometer, in your issue of January 25, I was, like him, in sore need of a sensitive instrument. and could not think of paying the prices asked by first-class makers.

My decision, however, was to make a portable instrument, and the sensitiveness of the first one, made at a total cost of about two shillings, was so gratifying that I spent a few shillings more in buying a magnet, made to my size, from specialists in magnet manufacture.

Two instruments were made, and the results obtained may be interesting to some of your readers.

No. 1 was mound with 300 turns of No. 40 wire to a resistance of 32 ohms. The scale is over 3 ins. long, and is divided with 3 main divisions, each of these being divided into 20-60 divisions in all. Full reading is 3 milliamperes, each small space indicating 1-20 of a milliampere ; 1-40 milliamp is easily read.

Shunts have been added, making it read 60 milliamps at full scale. and 3 amps. also (1-999 shunt).

This instrument is invaluable to me, and has had constant handling for 3 years, testing insulation resistance-up to about 5 megohns on 230 volt circuits--current taken by telephone transmitters and receivers, by electric lamps and bells, also on largest range, as ammeter in charging small accumulators.

No. 2 instrument is wound to 700 ohms, with No. 47 wire. It will easily show 1-200,000 ampere, and, used as a ballistic galvo., will, for instance, give an indication of the static capacity of a 9-light conduit wiring job.-Yours faithfully, A. O. GRIFFITHS.

Society and Club Doings.

Secretaries are notified that all notices of forthcoming meetings must reach us 10 days previous to date of publication of any given issue.

Model Engineering.

The Society of Model & Experimental Engineers.

On Monday, February 20, some 110 members " listened in," when Mr. H. Hildersley gave his interesting exposition on " Elementary Wireless, " interspersed, as it was, with valuable information about licences, aerials, and receiving sets, etc.

ORDINARY MEETINGS.—Wednesday, March 14, at Caxton Hall, at 7 o'clock. Mr. A. Proctor Mitchell on " The Ravenglass and Eskdale Miniature Railway. " Subsequent meetings, Wednesday, April 11, Wednesday, May 2, and Thursday May 31.

COMPETITIONS. --At each ordinary meeting there are competitions for the Challenge Shield and the Bronze Plaque and Medal ; the particulars and conditions are on the notice board at the meetings or may be obtained from the Secretary on application.

TREASURER.—Mr. A. J. R. Lamb, Room 173, Windsor House, Victoria Street, Westminster, S.W.1. He is still living in hopeful anticipation of the arrival of the subscriptions in arrears. Don't disappoint him.

The collectiong boxes so ably handled bv Mrs. Hart and Mrs. Bunt within the track enclosure at the *M.E.* Exhibition have enabled the Treasurer to pass on the sum of £25 10s. to each of the two Institutions—" The Royal National Lifeboat Institution " and " The Lord Roberts Memorial Workshops Fund, from both of which grateful acknowledgments have been received.

WORKSHOP.—Demonstrations, Monday, March 19, at 7 o'clock " Turning," by Mr. H. G. Echert ; March 26, " Marking Out," by Mr. R. A. Allman.

Rummage sale, Monday, April 9

Secretary, Mr. F. H J. BUNT, 31, Mayfield Road, Gravesend, Kent.

Model Railway Club.

An ordinary meeting of the Model Railway Club was held at St. John's Schools, Tottenham Court Road, on Thursday, February 22, 1923. After the reading of the minutes and the transaction of formal business, the chairman for the evening (Mr. W. R. S. Smart) called on the Secretary for his paper on " Making Model Signal Parts. " This paper dealt with a simple and cheap method of making in brass sheet and rod the parts necessary for a model signal, and proved to be of grea: interest to the members, who bombarded the lecturer with questions.

Mr. Saunders (a visitor) then proceeded to demonstrate an easy and inexpensive method of working signals by electricity, and exhibited an ingenious form of two-arm signal working from one lever, which also works a brake stop. This signal which he has himself designed for 0 gauge will shortly be on the market.

Hon. Secretary, T. W. PITT, 17, Northumberland Avenue, Wanstead Park, E.12

The Bristol Society of Experimental Engineers and Craftsmen.

FORTHCOMING MEETINGS.—March 20," Chains and Chain Making," Hy. G. Priest, the Secretary, who will deal with cable chain making generally.

The journal " Our Cog," No. 5 will be issued at the first meeting of the month.

Hon. Secretary, Hy G. PRIEST, 278, Bath Road, Bristol.

Manchester Society of Model & Experimental Engineers.

An ordinary meeting of the Society was held on Tuesday, February 20, at headquarters, Clarion Café, Market Street, City. Three new members were elected The next meeting is on March 20 ; an auction sale will be held. The meeting which should take place on April 3 next is cancelled owing to Easter ; April 17 will therefore be the only meeting during that month. On May 1 Mr. Wright will give a paper on " Springs. " This should be very interesting and should be well attended. Two lantern lectures are on the programme for the near future.

EXHIBITS.—Mr. Pinson, a well-made and efficient air compressor pump; a visitor, a well-made vertical steam engine ; Mr. Mills, a very neat vertical marine steam engine. If in town the next meeting, by the way, Mr. Mills will give a short paper on " Failures." This should be specially interesting. Secretary, pamphlet describing the Alklum accumulators, which appear good but a little stiff in price as things go. Messrs. Firth's catalogue, kindly sent by the firm, too well known for comment, also several numbers of the " Cog," the journal of the Bristol Society.

A few outstanding subscriptions still remain and would be welcomed. It is to be hoped that a good attendance will be seen at the next meeting. An invitation will be extended to anyone interested in the Society if they will communicate with the Secretary.

R. STUART NICHOL, Hon. Secretary, 405, Stretford Road, Manchester.

The Glasgow Society of Model Craftsmen.

The Glasgow Society of Model Craftsmen held their February meeting in the Society Room, Royal Technical College, on Thursday evening (February 8), at 7.30 p.m. Mr. James Welsh presiding. The subject for the evening was "Screw Threads," and was dealt with by W. E. Pickerel!, Esq. The lecturer in the course of his paper, described methods of gauging and measuring as devised at the N.P.L., and slides illustrating the fixtures used were projected on the screen.

Time did not permit the actual production of screws being dealt with So only a very limited period was allowed for discussion. One member created an uproar by stating he had discovered a Whitworth screw in a flint-lock (which some facetious fellow member declared had been used by the late King Tutankhamen !). The lecturer gravely remarked that Sir Joshua Whitworth had not invented screws, but had suggested a basis for standardising.

Headquarters are now fixed. The Governors of the Royal Technical College having agreed to grant us the use of the Society Room for "field-days" (nights) and of the Committee room on other occasions.

To-night, March 8, A. J. Fisher, Esq.. Convenor of the Wireless Section, will lecture on "Wireless Apparatus," and will describe his experimental set.

Will members please remember that tne Convenors of Sections have been elected for dealing with and are responsible for questions relating to their Sections. If there is any difficulty on the part of any member in getting needed information or getting in touch with any other member with a view of discussing models or relative matter, a note handed or posted to the Hon. Secretary will receive immediate attention.

D. C. YOUNG, Hon. Secretary, 198, Berkeley Street, Glasgow.

Dublin S.M. & E.E.

This Society met in University College, on Friday, February 23, when Mr. S. T. Robinson gave a lecture on "Internal Combustion Engines." He began by a short description of the action of the two classes of internal combustion engines, "The Four Cycle Type" and "The Two Cycle Type," and confined his remarks chiefly to those in motor-car and aeroplane work. He traced the various developments which have taken place as regards ignition devices, camshafts, carburettors. bearings, etc., and spoke at some length on the question of valves and timing and lubrication and gave some interesting details regarding the "Rolls Royce" aeroplane engines.

At the next meeting on March 9, Mr S. H. Medcalf will read a paper on "Electric Underground Railways," the lecture and slides being loaned by the Electric Underground Co.

EDWIN HAINES, Hon. Secretary, 14, Ashfield Park, Rathgar, Dublin.

Wireless.

The Radio Society of Great Britain.

A lecture ail! be given by L. F. Fogarty, Esq., A.M.I.E.E., at the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, at 6.30 p.m. on March 16, entitled "Accumulators, Dry Cells, and the Currents used in the Reception of Radio Telephony," illustrated by experiments.

This elementary lecture is intended for the Associate class of this Society, but anyone interested may obtain an admission card by forwarding a large stamped addressed envelope to Hon. Secretary, LESLIE McMICHAEL, M.Inst.R.E., 32, Quex Road, West Hampstead, X.W.6.

Notices.

The Editor invites correspondence and original contributions on all small power engineering, motor and electrical subjects. Matter intended for publication should be clearly written on one side of the paper only. and should invariably bear the sender's name and address. It should be distinctly stated, when sending contributions, whether remuneration is expected, or not, and all MSS. should be accompanied by a stamped envelope addressed for return in the event of rejection. Readers desiring to see the Editor personally can only do so by making an appointment in advance.

All subscriptions and correspondence relating to sales of the paper and books tc be addressed to Percival Marshall & Co., 66, Farringdon Street, London, E.C.4. Annual Subscription, £1 1s. Xd., post tree to all parts of the world.

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Contents.

The asterisk (*) denotes *that the subject* is illustrated